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(54) LIFT SYSTEMS AND LANDING DOOR LOCK AUXILIARY RELEASE MECHANISMS THEREFOR

(71) We, BENNIE LIFTS LIMITED, a British Company, of 16 Upper Grosvenor Street, London, WIX 0BQ, SERAPHIM EDWARD KRUGER, a British Subject, of Bennie Lifts Limited, Queens Walk, Peterborough, PE2 9AP, and ALFRED EDWARD GOTTS, a British Subject, of Bennie Lifts Limited, Tinworth Street, London, S.E.11., do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to lift systems and to landing door lock auxiliary release mechanisms therefor.

In lift systems it is usual to provide the landing door on each floor with a mechanically oprated lock release mechanism which is actuated during the normal operation of the lift by a retractable cam mounted on the lift car or the landing door, but which can also be actuated manually by a key inserted through a shaped aperture in the landing door from outside the lift well. The alternative manual method of opening each door is primarily used for maintenance purposes by service engineers and in such a case the engineer actuates the landing door lock release mechanism with an appropriate key and then opens the door manually. However, it has become evident that a more satisfactory method is required to avoid the landing door being opened by unauthorised persons.

This problem is particularly acute in the cases of lifts installed in blocks of flats or other buildings where children or vandals frequently open the landing doors employing articles other than the specifically designed key. Such action allows the lift equipment to be damaged and risks serious injury or death to the person who gains access to the lift well.

According to one aspect of the invention there is provided a lift system comprising a lift car for movement up and down a lift well and means which allow access to the lift well for maintenance purposes, which access means comprise an auxiliary release mechanism for a lock of at least one of a plurality of landing doors of the lift well, the auxiliary release mechanism comprising an electrical circuit including an electrically operated actuator to release the lock and a manually operable switch contact for operation of said actuator.

Said switch may be housed in a manner whereby it is physically protected from operation by an unauthorised person, for example in a locked compartment in the lift car or externally of the lift well, or in the machine room of the lift system.

The actuator may comprise a solenoid assembly fitted to the lock.

Preferably the electrical circuit includes a second switch which is operated when the lift car is in a predetermined position, for example a position which allows a service engineer to gain access to the top of the lift car or the underside of the lift car as may be desired. In one form of the invention said second switch may comprise a contact switch and means for actuating the switch, the contact switch being mounted on the lift car and the actuating means being mounted in the lift well or vice versa. Alternatively, said second switch may comprise a pair of electrical contacts, one contact being mounted on the lift car and the other contact being mounted in the lift well. In either case when the manually operable switch is operated, the landing door lock will be released when the contacts of said second switch make electrical engagement. If the manually operable switch is not operated, the landing door lock mechanism will not be released.

The electrical circuit may include an indicator which indicates when the landing

door lock mechanism has been released.

Preferably the electrical circuit is wired into safety circuits for the lift car to prevent movement of the lift car when the manually operable switch has been operated. Such safety circuits may also prevent the landing door lock auxiliary release mechanism from being initiated unless the lift car has stoppped in a predetermined position in the lift well.

According to another aspect of the invention there is provided a landing door lock for a lift system in which a lift car is moved up and down a lift well, the lock having a main release mechanism to release the lock during normal operation of the lift system, and an auxiliary release mechanism to release the lock and thereby to allow the landing door to be opened for maintenance purposes within the lift well, the auxiliary release mechanism comprising an electrical circuit including an electrically operated actuator to release the lock and a manually operable switch contact for operation of said actuator.

By way of example, specific embodiments in accordance with the invention will now be described with reference to the accompanying diagrammatic drawings in which:—

Figure 1 is an elevation, partly in section, of means for releasing, for maintenance purposes, a landing door lock assembly of a lift system;

Figure 2 is a sectional elevation of a lift system including the lock assembly of Figure 1;

Figure 3 is a sectional elevation of another lift system including the lock assembly of Figure 1; and

Figures 4 to 7 show different electric circuits for releasing the lock assembly of Figure 1.

The embodiments described below relate to a lift system having a lift car for travelling up and down a lift well between a number of floors, an electric motor housed in a machine room, and landing doors on at least some of the floors. The system is generally conventional, but in accordance with the invention there is provided an additional electrical circuit to release the door lock assembly on each of the two lowest landing doors, each of these two doors thereafter being able to be opened manually. It will be appreciated that this circuit replaces the conventional key for insertion through a shaped aperture normally provided in each landing door panel or surrounding enclosure area to release the respective lock assembly for maintenance purposes. In this case, the key aperture is not required.

Referring to Figure 1, during normal running of the lift system when a particular floor is required a retractable cam (not shown) on the lift car is actuated for engagement with a roller 10 which is moved by the cam and which thereby releases the landing door lock assembly on that floor. The roller 10 is mounted on a lever 23 carried on a shaft 12 of the lock assembly (not shown). The lock assembly is also capable of being released for maintenance purposes by actuation of a solenoid 13 having a coil 14 and a plunger 15 movable longitudinally to engage a lock release spatula 11 also carried on the shaft 12. Actuation of the solenoid thereby rotates the shaft 12 in a clockwise direction as viewed in Figure 1 and releases the respective landing door lock assembly.

Figure 2 shows a lift well 16 and, as stated above, there are provided solenoid operated door lock release assemblies 29, 30 on the landing doors 17, 18 respectively of the lowest two floors. For actuating the solenoid 13 of each door lock release assembly 29, 30 there is provided a separate electric circuit including a manually operated swtch 19, 20, the switch 19 being connected to the solenoid associated with the lowest landing door 17 and the switch 20 being connected to the solenoid associated with the landing door 18. Both switches 19, 20 are, in this embodiment, key-operated switches mounted in the lift car 22. Alternatively the switches may be mounted in a locked compartment or other convenient position in the lift car 22 whereby they are substantially inoperable by unauthorised persons. On the other hand the switches 19, 20 are operable by a service engineer who wishes to service or repair the lift, or any other authorised person.

In addition although it is not essential it may be desirable that each landing door lock assembly should be releasable only when the lift car is in a predetermined position. For example, in this embodiment the lock assembly associated with the lowest landing door 17 is releasable only when the underside of the lift car 22 is about 3 feet or 4 feet above the sill of the lowest landing entrance which position allows the service engineer access to the lift pit 24, and the lock assembly associated with the next higher landing door 18 is releasable only when the lift car is in a position in which the service engineer can gain access to the top of the lift car. To this end, the electric circuits for the door lock release assemblies include respective second contact switches 27 on the lift car 22 (only one contact switch 27 can be seen in Figure 2) for actuation by respective control cams or vanes, 25, 26 mounted in the lift well. Thereby each door lock assembly will be released only when the respective manual switch 19 or 20 is operated and the respective second contact switch 27 is actuated by the associated control cam or vane 25 or 26.

Figure 3 shows a similar arrangement to Figure 2 except that the switches 19, 20 are mounted beside the respective landing doors 17, 18 and the contact switches 27 are mounted in the lift well for actuation by a common control cam or vane 28 mounted on the lift car 22. As before, the switches 19, 20 are substantially inoperable by unauthorised persons.

Figure 3 also shows the predetermined position of the lift car 22 in which the lock assembly of the lowest landing door 17 is released, whereas Figure 2 shows the position of the lift car in which the lock assembly of the next higher landing door 18 is released.

Whilst the provision of the contact switches 27 and their cams or vanes 25, 26 are not essential, they are nevertheless preferred and are provided in these embodiments. It will also be appreciated that each contact switch 27 basically comprises any form of proximity or limit switch whch may be actuated for example mechanically, magnetically or by a light source for the desired purpose.

If desired the manually operated switches 19, 20 may be positioned in the machine room of the lift system instead of either of the positions indicated in Figures 2 and 3.

The simplest form of electric circuit for actuating i.e. releasing, the lock assemblies of the landing doors 17, 18 is shown in Figure 4. The electrical connections to the coil 14 of each solenoid 13 are connected in parallel and each coil is in series with its respective manually operated switch and its second contact switch.

Figure 5 shows part of a modified circuit including an indicator 31 to assist the service engineer in positioning the lift car. To determine when the lift car is correctly positioned, the respective switch 19, 20 is actuated. In this embodiment the lift car is correctly positioned when the indicator 31 is extinguished.

Figure 6 shows a further modified circuit in which switches 19, 20 are wired in series with additional or existing safety contacts 32, 33 to prevent movement of the lift car when one of the switches 19, 20 has been operated.

Figure 7 illustrated a still further modified circuit in which the switches 19, 20 are even further interlocked to prevent each lock assembly being released unless the lift car has stopped in the predetermined position in the lift well. To this end the circuit includes additional switches 34, 35 which are closed when the lift car is stopped and open when the lift car is moving, and switch 36 which is open when the lift car is stopped and closed when the lift car is moving.

If desired, similar electrically operated door lock release assemblies may be fitted to the higher landing doors or some of them, but in the interests of safety it is considered unnecessary.

It will be appreciated that the above described specific embodiments enable the provision of a lift system which does not require a conventional key or tool to be inserted through an aperture in a landing door or surrounding enclosure area. The manually operated switches 19, 20 may be positioned so that they are substantially inoperable by unauthorised persons and thus offer greater security than present systems against unauthorised use. To minimise the possibility of accidents, the two lowest landing door lock assemblies of the system are releasable only when the lift car is in such a position that deep voids are not exposed. Furthermore, in the embodiments described, only one landing door can be unlocked at any one time, and the system is such that it makes it harder to gain access to the lift well especially when the electricity supply is "off". Both these last features are desirable for safety and/or security reasons.

WHAT WE CLAIM IS:—

1. A lift system comprising a lift car for movement up and down a lift well and means which allow access to the lift well for maintenance purposes, which access means comprise an auxiliary release mechanism for a lock of at least one of a plurality of landing doors of the lift well, the auxiliary release mechanism comprising an electrical circuit including an electrically operated actuator to release the lock and a manually operable switch contact for operation of said actuator.

2. A lift system according to claim 1, wherein said switch is housed in a manner whereby it is physically protected from operation by an unauthorised person.

3. A lift system according to claim 1 or claim 2, wherein said switch is located in a locked compartment in the lift car or externally of the lift well, or in the machine room of the lift system.

4. A lift system according to any one of the preceding claims, wherein the actuator comprises a solenoid assembly fitted to the lock.

5. A lift system according to any one of the preceding claims, wherein the electrical circuit includes a second switch which is operated when the lift car is in a predetermined position, for example a position which allows a service engineer to gain access to the top of the lift or the underside of the lift car as may be desired.

6. A lift system according to claim 5, wherein said second switch comprises a contact switch and means for actuating the contact switch, the contact switch being

mounted on the lift car and the actuating means being mounted in the lift well or vice versa.

7. A lift system according to claim 5, wherein said second switch comprises a pair of electrical contacts, one contact being mounted on the lift car and the other contact being mounted in the lift well.

8. A lift system according to any one of the preceding claims, wherein the electrical circuit includes an indicator which indicates when the landing door lock has been released.

9. A lift system according to any one of the preceding claims, wherein the electrical circuit is wired into safety circuits for the lift car to prevent movement of the lift car when the manually operable switch has been operated.

10. A lift system according to claim 9, wherein the safety circuits also prevent the landing door lock auxiliary release mechanism from being initiated unless the lift car has stopped in a predetermined position in the lift well.

11. A landing door lock for a lift system in which a lift car is moved up and down a lift well, the lock having a main release mechanism to release the lock during normal operation of the lift system, and an auxiliary release mechanism to release the lock and thereby to allow the landing door to be opened for maintenance purposes within the lift well, the auxiliary release mechanism comprising an electrical circuit including an electrically operated actuator to release the lock and a manually operable switch contact for operation of said actuator.

12. A landing door lock according to claim 11, wherein said switch is located in a locked housing which precludes the switch from being operated by an unauthorised person.

13. A landing door lock according to claim 11 or claim 12, wherein the actuator comprises a solenoid assembly fitted to the lock.

14. A landing door lock as claimed in any one of claims 11 to 13, wherein the electrical circuit includes a second switch which is operable when the lift is in a predetermined position.

15. A landing door lock as claimed in any one of claims 11 to 14, wherein the electrical circuit includes an indicator which indicates when the landing door lock has been released.

16. A lift system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

17. A landing door lock for a lift system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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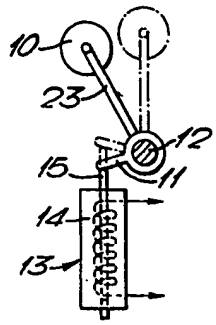

Fig. 1.

Fig. 2.

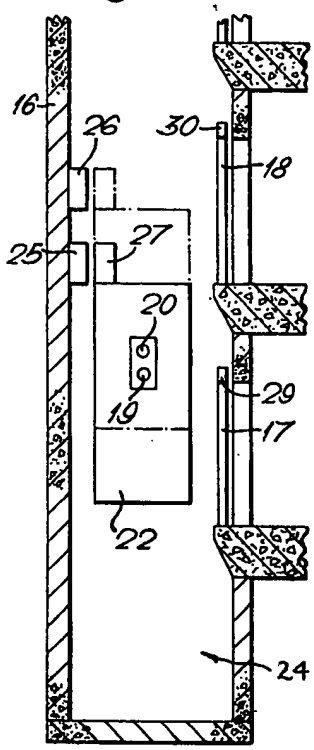

Fig. 3.

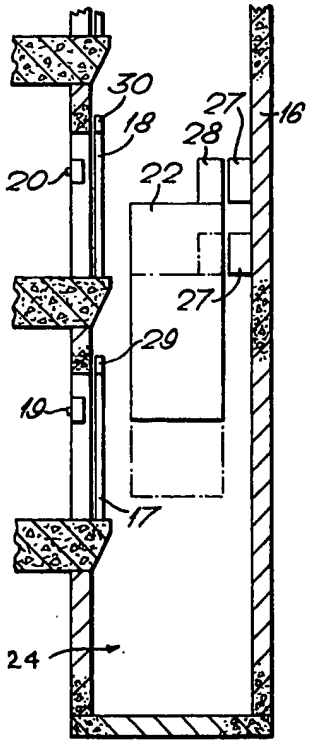

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Fig. 4.

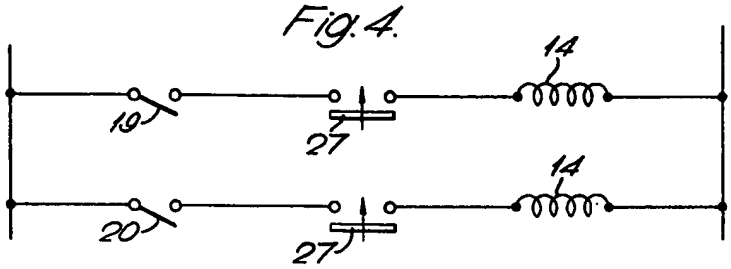


Fig. 5.

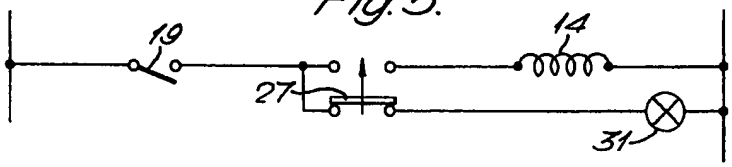
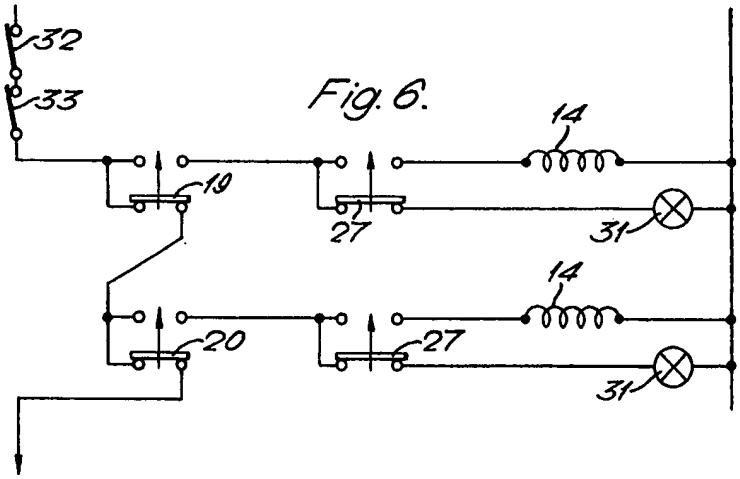


Fig. 6.



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SHEET 3

Fig. 7.